

CLAIMS

1. A method for defining the degree of fullness in a mill and the load toe angle (ϕ_k), where there are used oscillations directed to the mill electric motor, in order 5 to define the toe (4) of the mill load composed of the mass to be ground, **characterized** in that from the obtained measurements ($P(n)$), there is defined the phase (θ) of the mill oscillation by using a frequency domain analysis, and that by means of the mill oscillation phase (θ), there is defined the load toe angle (ϕ_k).
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2. A method according to claim 1, **characterized** in that in the frequency domain analysis of the mill oscillation, there is used oscillation related to the mill power draw.
- 15 3. A method according to claim 1, **characterized** in that in the frequency domain analysis of the mill oscillation, there is used oscillation related to the mill torque.
4. A method according to claim 2 or 3, **characterized** in that the frequency 20 domain analysis of the mill power oscillation is carried out by means of a Fourier transformation.
5. A method according to any of the preceding claims, **characterized** in that in order to make the degree of fullness of the mill and the load toe angle (ϕ_k) 25 independent of the fluctuations in the mill rotating speed, in each measurement there is measured the current angle of rotation of the mill, and by this measurement of the current angle of rotation, there are taken into account the speed fluctuations in the signal to be analysed in frequency domain.
- 30 6. A method according to any of the preceding claims 1 – 4, **characterized** in that in the measurement of the angle of rotation, part of the angles of rotation of

the mill are measured, and part are calculated from the measured angles by linear interpolation.

7. A method according to any of the preceding claims, **characterized** in that 5 when defining the degree of fullness by means of the load toe angle, there is applied a mathematical model, such as the JKMR model.
8. A method according to any of the preceding claims, **characterized** in that in 10 both the power measurement used when defining the mill degree of fullness, as well as the degree of fullness as such, are utilized in order to calculate the ball charge of the mill.
9. A method according to any of the preceding claims, **characterized** in that the 15 mill load toe angle used when defining the mill degree of fullness can be utilized in order to improve the grinding efficiency of the mill, when the point of impact of the grinding media is calculated by a mathematical model.